

FIRE WEATHER ANNUAL OPERATING PLAN

**WEATHER FORECAST OFFICE (WFO)
MORRISTOWN, TN**

March 2006

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I. Introduction

How the Fire Weather Program fits into the NWS/OM Mission...

Weather is one of the most significant factors in determining the severity of wildfires. The spread rate and intensity of fires is directly related to the wind speed, temperature and relative humidity. Climatic conditions, such as long term drought also play a major role in the number and intensity of wildfires. Accurate and timely weather information is vital to the planning and execution of strategies for suppressing wildfires. An accurate weather forecast can mean life or death to a fire fighter and is also critical in protecting forest and range lands as well as the increasing number of homes in the wildland-urban interface.

The Fire Weather Program is an integral part of the overall operations of the National Weather Service (NWS) at Morristown, Tennessee. This operating plan describes the fire weather products and services provided by the Morristown, TN Weather Forecast Office (WFO). The operating plan has been developed in cooperation with the primary user groups: Cherokee National Forest, Great Smoky Mountain National Park, Jefferson/Washington National Forest, Nantahala National Forest, Tennessee Division of Forestry, Virginia Division of Forestry and North Carolina Division of Forestry.

The products and services provided to the above land management agencies are geared for three main reasons: (1) contain and minimize the destructive potential of wildfires to life, property and natural resources, (2) reduce the adverse impact of smoke from prescribe burns near populated areas, and (3) aid in the management of prescribe burns. The operating plan has been prepared in accordance with the "National Agreement for Meteorological Services in Support of Agencies with Land Management and Fire Protection Responsibilities" concluded in March 2002 and included in Appendix A.

II. Organizational Directory

National Weather Service
Weather Forecast Office
5974 Commerce Blvd.
Morristown, TN 37814

Meteorologist in Charge (MIC)

George Mathews

Fire Weather Program Leader

David Gaffin

Tim Doyle - Assistant

The Weather Forecast Office is staffed 24 hours a day, 7 days a week throughout the year. Public and aviation weather forecasters are available for special forecasts or questions and consultation, conditions permitting.

Telephone Numbers:

Fire Weather coordination: 1-800-697-0075 or 423-586-6429

Administrative: 423-586-6429

Fax: 423-586-9336

Internet site (webpage) - www.srh.noaa.gov/mrx

NOAA Weather Radio Transmitters from WFO Morristown:

Chattanooga (WXK-48) at 162.550 MHz serving Bledsoe, Bradley, Hamilton, McMinn, Marion, Meigs, Monroe, Polk, Rhea, Roane, and Sequatchie counties of southeast TN; and Catoosa, Chattooga, Dade, Gordon, Murray, Walker, and Whitfield counties of northwest GA

Knoxville (WXK-46) at 162.475 MHz serving Anderson, Blount, Campbell, Claiborne, Cocke, Grainger, Hamblen, Jefferson, Knox, Loudon, Monroe, Morgan, Roane, Scott, Sevier, and Union counties of central east TN

La Follette (WNG-732) at 162.450 MHz serving Anderson, Campbell, Claiborne, Morgan, Scott, and Union counties of the northern Cumberland Plateau

Tri-Cities (WXK-47) at 162.550 MHz serving Carter, Greene, Hancock, Hawkins, Johnson, Sullivan, Unicoi, and Washington counties of northeast TN; Lee, Russell, Scott, Smyth, Washington, and Wise counties of southwest VA; and Ashe, Avery, Madison, Mitchell, Watauga, and Yancey counties of northwest NC

NOAA Weather Radio Transmitters programmed by other NWS offices that cover portions of WFO Morristown's fire weather area of responsibility:

Harlan, KY (WWG-68) at 162.450 MHz serving Lee and Wise counties of southwest VA

Pineville, KY (WWG-62) at 162.525 MHz serving Lee and Wise counties of southwest VA

Pikeville, KY (WWG-69) at 162.400 MHz serving Lee and Wise counties of southwest VA

Beechgrove, TN (WXK-63) at 162.475 MHz serving Coffee, Franklin, and Moore counties of southern middle TN

Spencer, TN (WNG-629) at 162.500 MHz serving Bledsoe, Grundy, and Van Buren counties of the southern Cumberland Plateau

Winchester, TN (WNG-554) at 162.525 MHz serving Coffee, Franklin, and Moore counties of southern middle TN

Blue Ridge, GA (KXI-75) at 162.475 MHz serving Cherokee county of southwest NC and Polk county of southeast TN

Brasstown Bald, GA (KXI-22) at 162.500 MHz serving Clay county of southwest NC

Joanna Bald, NC (WWG-82) at 162.525 MHz serving Cherokee and Clay counties of southwest NC

III. Operational Program

WFO Morristown, TN provides three basic forecast products which support fire management and fire control operations in the states of Tennessee, Virginia and North Carolina. These three products are the routine fire weather planning forecast or pre-suppression forecast (FWF), National Fire Danger Rating System (NFDRS) forecast (FWM), and spot forecast.

As a cooperative effort between the forestry community and the weather service, periodic review and modification to the operational program will be done to meet the changing needs of the users. Any major changes to the program will result in accompanied revision of the operating plan.

A. Normal Fire Weather Season

The prescribe burn season across the WFO typical runs from mid-February to early-May. Generally, the greatest threat for wildfire occurs from mid-October to mid-December due to the fallen leaves and normally dry weather.

B. Types of Fire Weather Forecasts and Issuance times

1. Routine morning Fire Weather Planning Forecast (FWF) - 6:00 am (LST)
2. Seasonal (mid-February to mid-May) afternoon FWF - 4:00 pm (LST)
3. Spot Forecasts for wildfires – as needed from both Federal and State Foresters.
4. Spot Forecasts for prescribed burns – as needed from **Federal agencies only**.
5. NFDRS forecast – upon arrival of the Fire Weather Observation (FWO) from WIMS.
6. Updated or revised FWF - as conditions warrant (refer to section III-F).

C. Forecast area for the Fire Weather Forecast

The Fire Weather Forecast will always be broken down into eight different fire zones. The different sections are list as follows: (please refer to the Fire Weather Forecast map in the appendix).

Fire Weather Forecast Zones

1. Jefferson-George Washington National Forest/Virginia Forestry District 6
2. Northern Cherokee National Forest
3. Great Smoky Mountain National Park
4. Southern Cherokee National Forest
5. Nantahala National Forest/North Carolina Forestry
6. Tennessee State Forestry District 1
7. Tennessee State Forestry District 2
8. Tennessee State Forestry District 3

D. Forecast Methodology

Forecasts are made to reflect the worst expected conditions in terms of fire management within the fire weather forecast zone during a given period. For example,

the daytime forecast will depict the hottest, driest, and windiest conditions that are expected. On occasion, the Fire Weather Forecast may differ from the general public forecast, which emphasizes prevailing conditions during the period and is usually aimed at more populated urban or developed parts of the area.

Since the Fire Weather Forecast can not reflect all the local variations in the weather, a spot forecast should be requested whenever local effects are suspected of creating difficult fire management conditions.

Over mountainous terrain, weather conditions can vary greatly from site to site within the same fire weather zone. Routine Fire Weather Forecast for mountain zones (Cherokee National Forest, Great Smoky Mountain National Park, and Nantahala National Forest) will be aimed at a target elevation. The target elevation for the Jefferson National Forest, Northern Cherokee National Forest and Smoky Mountain National Park will be around 2500 feet. For the Southern Cherokee and Nantahala National Forests the target elevation will be near 1500 feet.

As a general rule in mountainous terrain, those sites above the target elevation and/or north facing slopes will have a lower temperature and higher relative humidities than forecast. Conversely, sites at lower elevations and/or south facing slopes will average warmer and drier than the forecast.

E. Morning-Afternoon Forecast Format and Content of Routine FWF

The Fire Weather Planning Forecast format was developed in coordination with the Federal and State forestry community. The morning FWF will contain a forecast for three periods: Today, Tonight, and Tomorrow. The afternoon FWF will contain a forecast of four periods: Tonight, Tomorrow, Tomorrow night, and next day. The “today” forecast covers the period from the issuance time to sunset, “tonight” covers from sunset until sunrise tomorrow, and “tomorrow” covers from sunrise to sunset. An extended forecast will be

added to each forecast group for both the morning and afternoon FWF.

Contents of the Fire Weather Planning Forecast (FWF):

Headline - A headline will be used to emphasize a fire weather watch, red flag warning, or any specific weather change that will greatly affect fire suppression.

Discussion – The discussion is a brief description of weather systems and their effect on the Tennessee valley and southern Appalachians for the duration of the forecasts. Significant weather features, such as strong wind, fronts, or low humidity, will be discussed in this section. Significant changes to wind, humidity and precipitation should be emphasized first.

Cloud Cover - The following are the different cloud forecasts and their associated definitions:

Cloud Cover	Definitions
CLEAR	less than 1/10 opaque clouds
PCLDY	(Partly Cloudy) 4/10 to 7/10 opaque clouds
MCLDY	(Mostly Cloudy) 8/10 to 9/10 opaque clouds
CLOUDY	more than 9/10 opaque clouds

TEMP (Temperature) and **RH % (Relative Humidity)** - Temperature and relative humidity are very important fire weather parameters, specifically relative humidity. We'll forecast high temperatures and lowest relative humidity for the daytime forecasts and lowest temperature and highest relative humidity for the nighttime forecast. Factors such as elevation, aspect (ie. south facing slope) and ground cover cause temperatures to vary several degrees in a small area.

WIND-AM (MPH) and **WIND-PM (MPH)** - Wind is perhaps the most important weather element to fire fighters. In the fire weather forecast the daytime wind prediction

will be broken into two periods - AM and PM. This is to allow forecasters to take into account diurnal variations in speed which frequently occur, resulting in smaller ranges. Speed values represent a one-minute average in miles an hour, 20 feet above the ground in exposed areas. Direction is expressed using eight compass points (ie. N, NE, E, etc.). Wind gusts are indicated in the forecast if greater than ten miles an hour over the sustained speed. If the wind is forecast to be less than 5 mph, then a forecast of Light and Variable will be given (abbreviation LGT/VRB).

Precipitation type, amount and duration - A prediction of precipitation type will be given when expected. Forecasters need to be alert to possibility of lightning hazards, giving thunderstorms priority over other types. An estimate of the amount of rainfall and duration will be included in the forecast when precipitation is expected (POP 20 percent or greater). Amounts will be estimated to the hundredths inch and duration in hour(s) that the precipitation is expected to fall. In the case of frozen precipitation, a water equivalent amount will be given in the forecast. The precipitation amount should be similar to your QPF forecasts (approximately basin average).

<u>PRECIP TYPE</u>	<u>Definitions</u>
NONE	No Precipitation
DRIZL	Drizzle/Misty Precipitation
SNOW/RAIN	Mix of Snow and Rain
FRZ RAIN	Freezing Rain (rain that freezes on exposed surfaces)
RAIN	Liquid Precipitation
TSHWR	Showers with Thunder

CHANCE PRECIP (%) - Probability numbers in the forecast represent the expected occurrence of 0.01 inch or more of precipitation at any point in the fire weather zone during a forecast period.

PRECIP BEGIN and PRECIP END - Since time of occurrence can be very helpful

to the forestry community, a forecast of Precip Begin and Precip End will be given. The time will correlate with local standard time (LST) (Examples: 4 AM, 11 PM). If the precipitation is expected to continue into the next time period, then **CONTINUE** will be included.

LASI - Lower Atmospheric Stability Index (LASI) is an indicator of stability resulting from measurement of temperature and moisture differences in the lower portion of the atmosphere. Large temperature differences just above the surface create an unstable environment and have been associated with extreme fire behavior. The **LASI (or Haines Index)** is included in the Fire Weather Forecast mainly as a safety reference, providing firefighters with information on atmospheric stability.

The lower atmospheric stability index used in the Tennessee forecast is identical to the one developed by Donald Haines (sometimes referred to as the **Haines Index**), with the exception of the lowest height measurement. The newer mandatory level at 925 millibars (mb) is used to make calculations easier. For lower elevations:

(A) 925 mb T - 850 mb T	Factor Values
less than 4 degrees C	1
4 to 8 degrees C	2
greater than or equal to 8 deg C	3

(B) 850 mb T - 850 mb Td	Factor Values
less than 6 degrees C	1
6 to 10 degrees C	2
greater than or equal to 10 deg C	3

Add the factor values (A + B) to obtain the LASI. For higher elevations of east Tennessee use 850 mb T - 700 mb T to obtain the A value.

<u>LASI</u>	<u>CLASS OF DAY</u>
2 or 3	very low
4	low
5	moderate
6	high

A forecast of LASI will be given in both the Today and Tomorrow forecast. This forecast will reflect the expected LASI during the afternoon or peak heating of the day.

MIXING HGT (FT-MSL) and TRANSPORT WND (MPH) - A projected height of vertical mixing of air and suspended particles will be forecast for the day periods in feet above **Mean Sea Level (MSL)**. It is valid for use during the afternoon hours when temperature nears the predicted maximum. Transport wind speed is a predicted average wind in miles an hour in the layer below the mixing height. This parameter is also valid for the afternoon hours.

REMARKS - The remarks section will allow the forecaster to include any specifics about the forecast (such as timing of fronts or amount of maximum possible rainfall) that is deemed crucial for the fire land management agencies.

FORECAST FOR DAYS 3 THROUGH 7 - A prediction of general weather conditions expected to occur in each fire weather zone group during the next 5 days.

F. Updated Fire Weather Planning Forecast

The Fire Weather Planning Forecast (FWFMRX) will be updated when the expected weather changes significantly from what was predicted in the routine forecast. The decision to issue a fire weather update will be based on the effect the weather change has on the fire behavior and the level of fire danger in the state(s). An update may be issued at any time of day and using the following guidelines:

1. If precipitation was not mentioned in the previous forecast and looks likely or if it was forecast as being predominant and now looks as if it will not occur or remain isolated an update should be issued.

2. An update should be considered when a front and its associated wind shift is much delayed or arrives sooner than expected.

3. An update should be considered whenever the wind speed is much stronger or lighter than previously expected. Differences of 10 to 15 mph in most cases are significant and may also apply to gustiness. If the wind direction differs by two or more compass points (more than 45 degrees) an update may be needed if the prevailing wind speed is 15 mph or more.

4. When relative humidity drops to very low levels (30 percent or less) and differs by more than 15 percent from the morning forecast an update should be considered, or if the relative humidity remains high and low levels had been previously forecast.

G. Spot Forecasts

The National Weather Service at Morristown, TN will provide, on request, a specialized forecast for existing wildfires or prescribe burns for the federal forests and parks. The NWS will provide spot forecast for the state forester for wildfires, if needed for public safety. The spot forecast is a site-specific, localized forecast of weather, wind (including slope and valley winds in mountainous terrain), maximum and minimum temperature and humidity. Duration time of the forecast is generally for 24 hours. The land management agency is encouraged to use the NWS Web-based SPOT program. If the NWS SPOT program is unavailable, then you may use local fax or phone to request a SPOT forecast.

When possible, information items 1 through 11 on WS form D-1 should accompany

a request for this type of information. It is particularly important to issue a revised forecast promptly in the event of a previously un-forecast or mistimed wind shift or wind increase and precipitation.

Recent observations at or near the fire site should be obtained before issuing a spot forecast. It is advised that hourly observations begin 24 hours before the request. If an observation is not provided then the user of the forecast should be informed that the accuracy of a forecast depends on this information.

The forecaster should attempt to provide response to the land management agency within 30 minutes of a request, time permitting. If the response time will be longer, then the user should be informed at the time of the request.

Example of a Spot Forecast...

SPOT FORECAST FOR (location or name of burn)
NATIONAL WEATHER SERVICE MORRISTOWN TN
800 AM EST TUE APR 16 2004

IF CONDITIONS BECOME UNREPRESENTATIVE, PLEASE CONTACT THE NATIONAL WEATHER SERVICE.

...HEADLINE...

(if a Red Flag Warning is in effect, a headline is required - otherwise, a headline is recommended for every issuance)

DISCUSSION...

FIRST PERIOD

SKY/WEATHER.....

TEMPERATURE.....
RH.....(the maximum or minimum relative humidity)
WIND.....(specify the wind level)
MIXING HEIGHT.....(maximum height in Mean Sea Level)
TRANSPORT WINDS....(MPH)

SECOND PERIOD

SKY/WEATHER.....
TEMPERATURE.....
RH.....(the maximum or minimum relative humidity)
WIND.....(specify the wind level)
MIXING HEIGHT.....(maximum height in Mean Sea Level)
TRANSPORT WINDS....(MPH)

THIRD PERIOD

SKY/WEATHER.....
TEMPERATURE.....
RH.....(the maximum or minimum relative humidity)
WIND.....(specify the wind level)
MIXING HEIGHT.....(maximum height in Mean Sea Level)
TRANSPORT WINDS....(MPH)

H. National Fire Danger Rating System (NFDRS) Forecast

NFDRS forecast is issued for selected RAWS observation site. These forecasts are used as input for the National Fire Danger Rating System which generates indices which are used in determining fire danger for a given area and to plan for the necessary human and other resources to fight wildfires.

The NFDRS is a means for forest managers to evaluate fire danger. It consists of a complex model of fuel and weather parameters input on a daily basis to obtain a numeric output that indicates the severity of fire danger in an area representative of the input values.

Fire weather observation sites used for NFDRS input usually represent the worst conditions in terms of dryness in a given forest or area. The ideal site would be one on a south or west facing slope without obstructions to wind. Parameters measured include weather and fuel moisture, with observation time around 1 pm LST daily. The observed data is entered into WIMS (Weather Information and Management System) by the forestry agency, and then is received by NWS under the product header FWOMRX.

Utilizing the current weather as a starting point, the weather forecaster will enter the predicted 24 hour weather parameters for the observation point. Usually within the next hour, the fire manager will be able to retrieve fire danger indices from WIMS based on the forecast provided. This information processed with predicted weather through 24 hours gives land managers an estimate of fire severity in their area of responsibility. The site forecast will be issued under the product header FWMMRX (WMO FNUS84).

The weather service is obligated to make a forecast for each observation that is received from WIMS.

I. Red Flag Warning/Fire Weather Watch (RFWMRX)

A Red Flag Warning is issued when forecast conditions, together with existing environmental conditions, could result in extreme fire behavior or, as in the case of lightning with brief rain, high winds and low humidity, extensive fire starts within the next 24 hours. A Fire Weather Watch will be issued if Red Flag Warning conditions are possible in the next 36 to 48 hours. These products will be issued under the product (RFWMRX). A highlight of the Red Flag Warning or Fire Weather Watch should be included within the routine fire weather forecast.

Conditions which warrant the issuance of a Red Flag Warning or Fire Weather Watch are the following:

1. Strong winds with low humidity, generally 18 mph or higher sustained wind speeds with less than 25 percent relative humidity.
2. Rainfall of less than 0.25 inch during the past two days.

NWS Morristown, TN will coordinate the issuance of a Red Flag Warning of Fire Weather Watch with the associated land management agency. We will ask for fire danger and areas of concern.

Example of a Red Flag Warning...

TNZ039-070-111800-

RED FLAG WARNING

NATIONAL WEATHER SERVICE MORRISTOWN TN

1245 PM EST SUN MAY 10 2004

...RED FLAG WARNING FOR EAST TENNESSEE THIS AFTERNOON AND MONDAY FOR LOW RELATIVE HUMIDITIES AND HIGH WINDS...

DISCUSSION...

A RED FLAG WARNING IS IN EFFECT FOR ALL OF EAST TENNESSEE FOR THE REMAINDER OF THIS AFTERNOON AND CONTINUING THROUGH MONDAY.

VERY LOW AFTERNOON RELATIVE HUMIDITY READINGS BETWEEN 15 AND 20 PERCENT COMBINED WITH STRONG WEST TO SOUTHWEST WINDS BETWEEN 15 AND 20 MPH HAVE RAISED THE POTENTIAL FOR WILDFIRES TO EXTREME LEVELS. SEVERAL MONTHS OF BELOW NORMAL PRECIPITATION HAVE ALSO CONTRIBUTED TO THE VERY VOLATILE SITUATION.

A DEVELOPING STORM SYSTEM ACROSS THE CENTRAL PLAINS WILL BRING A COLD FRONT INTO TENNESSEE MONDAY AFTERNOON. DUE TO THE LIMITED MOISTURE WITH THIS SYSTEM, LITTLE IF ANY PRECIPITATION IS EXPECTED. HOWEVER, AFTER THE FRONTAL PASSAGE, A DROP IN WIND SPEEDS AND AN INCREASE IN RELATIVE HUMIDITY ARE EXPECTED WHICH WILL AID IN LESSENING THE FIRE DANGER ACROSS THE AREA.

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J. Fire Danger Statements

In cooperation with fire control agencies, the WFO Morristown, TN can issue special statements to inform the general public about critical fire danger. These statements may contain information from land management agencies about burning bans and preparedness actions as well as weather information.

Special statements may be broadcast to the public on NOAA weather radio stations throughout east Tennessee, southwest Virginia and extreme southwest North Carolina.

IV. Special Services

Special meteorological services meet the needs of land management agencies who occasionally have unique requirements for weather support, such as large wildfires. This support often requires travel of weather service personnel. Agencies requesting these services usually pay for travel and per diem for the meteorologist and for any overtime which may be required.

Special services include on-site meteorological support for wildfires, weather observer training, weather station visitations requested by user agencies, and participation in user agency training activities.

A. Incident Meteorologist (IMET)

These are specialized trained meteorologists to work with wildfire suppression foresters on the site of the fire to provide fire weather support. They will utilize Air Transportable Mobile Units (ATMU) to give them local observations and meteorological forecast guidance at the wildfire site. IMETs are most likely to be requested during large

and complex fire fighting operations which may extend over a period of several days or possibly weeks. The fire community is responsible for requesting IMETs.

The Fire Weather Program Manager or the Meteorologist in Charge at the NWS at Morristown, TN should also be advised of the need for an ATMU and IMET.

Mobile Unit Services

A modularized Air Transportable Mobile Unit (ATMU) is a collection of weather instruments and computer equipment which can be transported quickly to a wildfire or other emergency by air or ground freight. These units are stored at federal fire caches around the country and are available as a resource for an IMET for use in emergencies requiring weather support. Request for an ATMU must be called in along with a request for an Incident Meteorologist (IMET) to a regional USDA Forest Service Office.

The requesting agency is responsible for coordinating transportation of the ATMU and IMET to and from an incident. Provisions must be made at the site for sheltering the equipment and IMET as well as a telephone and electrical equipment.

B. Fire Weather Training

National Weather Service fire weather meteorologists are available to assist Land Management agencies with training at fire behavior courses (S290, S390, NFDRS, etc.). Requests for assistance should be in writing to:

Meteorologist in Charge
National Weather Service
5974 Commerce Blvd.
Morristown, TN 37814

C. Severe Weather Reports

Severe weather reports are extremely important and helpful to the staff at NWS Morristown, TN during severe weather events. Our most important responsibility is to warn the public of impending weather hazards. Very little information is available from the remote mountainous areas of east Tennessee, southwest Virginia and western North Carolina. These areas coincide with the areas of concern by land management and fire control agencies.

If severe weather is occurring, please relay the information immediately to the NWS staff at Morristown, TN so they can promptly warn the general public. Call in reports to phone number 423-586-6429 or any other Morristown, TN weather office number.

The National Weather Service will gladly provide free training about severe weather to groups interested in helping us with this task. The NWS program through which groups of people are trained to recognize and report severe weather is known as SKYWARN.

What to Report:

1. Tornadoes, Funnel Clouds, Waterspouts
2. Winds 58 mph and over or wind damage
3. Hail - dime size diameter or greater
4. River flooding or flash flooding of creeks
5. Snow - 4 inches or more
6. Hazardous ice accumulations on roads, trees, or power lines.

If damage is detected from a storm on following days, the information is still needed for 'Storm Data', a publication issued by the NWS that keeps a historical record by state of severe weather occurrences. It also helps the forecaster to assess past storms and improve detection probability and forecast techniques for future storms. Please call the NWS Forecast Office during administrative hours, if possible, with this information.

V. Communications

Fire weather forecasts issued by the National Weather Service in Morristown, TN are stored locally and then transmitted to a centralized computer located in Washington, DC. The centralized computer has the ability to communicate with the Forest Service's Weather Information Management System (WIMS), allowing fire managers with computer access into WIMS to obtain weather forecasts for any location in the United States. This method of communication is used primarily by the USDA Forest Service and the National Park Service.

The National Weather Service in Morristown, Tennessee will include the Fire Weather Forecast within our Internet webpage (<http://www.srh.noaa.gov/mrx/firewx.php>).

APPENDICES

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A. National Agreement for Meteorological Services

B. Fire Weather Forecast Zones Map

C. Examples of Fire Weather Forecasts and Statements

D. Weather Service Form D-1 (Spot Forecast Request)